years; but the effect of pressure on the temperature of solidification must also be taken into account, and Mr. Clarence King, after a careful scrutiny of all the data given to him for this purpose by Dr. Barus, concludes that without farther experimental data "we have no warrant for extending the earth's age beyond 24 millions of years."

By the solution of the conductivity problem to which I have referred above, with specific heat increasing up to the melting point, as found by Rücker and Roberts-Austen and by Barus, but with the conductivity assumed constant, and by taking into account the augmentation of melting temperature with pressure in a somewhat more complete manner than that adopted by Mr. Clarence King, I am not led to differ much from his estimate of 24 million years. But, until we know something more than we know at present as to the probable diminution, or still conceivably possible augmentation, of thermal conductivity with increasing temperature, it would be quite uninteresting to publish any closer estimate.

In the latter part of Mr. Clarence King's paper on the "Age of the Earth" the estimates of the age of the sun's heat by Helmholtz, Newcomb, and myself, are carefully considered, and the following sentences with which the paper is brought to a conclusion will, I am sure, be interesting to readers of NATURE:—"From this point of view the conclusions of the earlier part of this paper become of interest. The earth's age, about twenty-four millions of years, accords with the fifteen or twenty millions found for the sun.

"In so far as future investigation shall prove a secular augmentation of the sun's emission from early to present time in conformity with Lane's law, his age may be lengthened, and further study of terrestrial conductivity will probably extend that of the earth.

"Yet the concordance of results between the ages of sun and earth, certainly strengthens the physical case and throws the burden of proof upon those who hold to the vaguely vast age, derived from sedimentary geology."

KELVIN.

## NOTES.

IN addition to Lord Aberdare, the Royal Society has to mourn the loss of two more of its Fellows. Sir Henry Rawlinson, the distinguished Orientalist, died on Tuesday, in his eighty-fifth year. He was elected into the Society so long ago as 1850. Sir William Savory, who died on Monday, at the age of sixty-nine, was admitted eight years later.

WE have also to announce the death of Dr. D. H. Tuke, well known for his works on psychological medicine.

IT is announced in the *British Medical Journal* that Dr. Armand Ruffer has tendered his resignation of the post of Director of the British Institution of Preventive Medicine.

WHEN the news of Prof. Cayley's death reached America, American mathematicians were not slow in expressing sympathy with their English brethren. We are informed that—"In that great American University, the Johns Hopkins, in which, not many years ago, Prof. Sylvester and Prof. Cayley, at the same time, gave instruction in advanced mathematics, the death of Prof. Cayley was the occasion of universal mourning, and all was appropriately draped with black."

IT appears from a correspondence between the Board of Trade and the Electric Lighting Committee of the St. Pancras Vestry, that Major Cardew, the electrical adviser of this department, has discovered, during his investigations into the recent explosions in the street boxes used for electrical supply in St. Pancras, that a remarkable deposit on some of the insulators contained a considerable quantity of the metal sodium. The presence of this metal appears to be so grave a source of danger, and to afford so reasonable an explanation, in connection with the accumulation of escaped coal-gas, of the several explosions which have recently occurred, that the Board of Trade intends to investigate the causes of the deposit of this substance with a view to its prevention, and in this investigation they have asked for the assistance of the Royal Society and of the Institution of Electrical Engineers.

PROF. CHARLES STEWART will deliver a course of six lectures on "The Internal Framework of Plants and Animals," at the Royal College of Surgeons, Lincoln's Inn Fields, on March 11, 13, 15, 18, 20, and 22, at five o'clock. Admission to the lectures can be obtained on presentation of visiting card.

A CORRESPONDENT, writing from Brooklyn on February 16, says:—The severity of the weather and depth of snowfall throughout the southern United States for the past few days are unparalleled. On the 14th inst. the temperature at Abilene, Texas, was 15°, and in the State of Georgia it ranged about 9° lower than in New York city. Yesterday there was snow five inches deep in Atlanta, four inches at Darien, three inches at Thomasville, and two inches at Savannah, all in Georgia; two feet at Birmingham, Alabama; eight inches at New Orleans, Louisiana; six inches at Galveston, Texas, with snow falling as far south as Corpus Christi. In many places there had never before been snow enough to cover the ground to any measurable depth.

FROST prevailed during the greater part of the past week in nearly all parts of the United Kingdom, and in the northern and midland districts the thermometer in the screen has on several nights fallen as much as 10° below the freezing point. Snow has fallen over the greater part of the country, and in Scotland the amount has been heavy. The type of weather has been chiefly anti-cyclonic, and an area of low barometer readings was for several days situated to the eastward of our islands, so that strong and cold northerly winds were experienced over the entire country. A correspondent at Dundee states that the temperature in that district during the last two months was unusually low. The average maximum temperature of January and February was 36°·6, and the average minimum, 24°·9, so that the average mean temperature for that vicinity was about 30°·7. The normal values published by the Meteorological Council for Leith, a little more to the south, give 39°·5 as the average mean temperature for the two months.

PROF. M. MÜLLER contributed an article to the January number of *Globus* (Brunswick) on meteorology and the figure of the earth, which contains much useful information upon the subject of atmospheric circulation, and the results of the author's own investigations. He points out very clearly the effects of the earth's rotation and of the polar compression on the motion of the air, and strongly opposes the theory of equatorial and polar currents as propounded by Dove and his adherents. He explains the enormous forces that would be required to transpose a kilogram of air from the pole to the equator, and shows that the motion of a particle closely resembles that of a ball which is kept in circular motion on a revolving plate by a juggler, the rapid rotation of the plate, and of the earth, acting similarly on both ball and air, and keeping both moving in comparatively small and nearly closed curves.

DR. A. CANCANI notes the existence of two systems of undulations in the Constantinople earthquake of July 10, 1894, one propagated with a velocity of 4·9 km. per second, the other with a velocity of 2·3 km. per second (*Rend. dell' Acc. dei*

*Lincei*, December 16, 1894). The latter estimate is obtained from the times furnished by magnetic or astronomical observatories, possessing instruments capable of recording long-period oscillations only. The instruments of the Italian seismic observatories, on the other hand, registered the rapid movements travelling with the greater velocity, as well as the longer oscillations, whose velocity is again found to be 2·3 km. per second. Dr. Cancani remarks that these results agree with the theory explained by him in a former paper (*Ann. dell' Uff. Centr. di Met. e Geod.* vol. xv. 1893).

NEWS has recently been received regarding the three attempts made last year to extend our knowledge of the higher mountains of Africa. The most important of these was Mr. Scott Elliot's expedition to Ruwenzori, some of the preliminary results of which he announced in a recent letter to NATURE. Mr. Scott Elliot seems to have found the higher slopes of the mountain extremely trying to the native porters. Botanical results of the highest interest may be expected from the work of such an experienced African botanist. As Mr. Scott Elliot did not succeed in reaching the highest zone in the mountain, his description of its geology may be incomplete. He has, however, announced one conclusion of the highest importance, viz. the discovery of traces of the existence of glaciers, seven miles below the existing snow-line. It will be remembered that in a recent paper published by the Geological Society, Dr. J. W. Gregory fully described similar glacial extension on Mount Kenya. The difficulty, however, has been felt that the same fact has not been recorded from Kilima Njaro, in spite of the numerous visits to that mountain. The glaciers there now seem to be at their greatest extension. It is probable that this is due to the fact that the peak with the existing glaciers is of very recent date. The absence of moraines from the older peak appeared perplexing. Mr. Scott Elliot's discovery, however, shows that the greater glaciation of Kenya was not due to a purely local cause, but to some change that affected the whole region.

WE have received a copy of the *British Central Africa Gazette* (vol. i. No. 15), describing Capt. Manning's recen ascent of Mount Mlanje, on October 22–25. The mountain ist now well known from the botanical collections made there by Mr. Whyte, under the direction of Mr. H. H. Johnston. Previous attempts to ascend it had, however, failed through lack of time. Capt. Manning's party do not appear to have found the climbing very difficult. The summit is estimated at 9680 feet; but we are not told by what method this was determined. Apparently it was only by aneroid. The party were helped up by a new method of roping, which ought to recommend itself to the Chamounix and Zermatt guides. They used a long loop of calico, which they called a "machila": the climber leant back at one end of it, six or eight strong men pulled at the other. Probably in time, to "machila the Matterhorn" will be the regular thing in a Swiss trip.

THE third expedition to which we have to refer, has unfortunately not been successful in its attempt to solve the mystery of the reported snow-clad mountain which occurs between Kenya and Abyssinia. The existence of this has been frequently reported since it was first recorded by Abbadie as Mount Wosho. It was hoped that Dr. Donaldson Smith's expedition would have finally settled this question of the height and position of this mountain. The expedition has, however, been stopped by the Abyssinians, and sent back to the Somali frontier at Barri. His companion, Mr. Gillatt, has been compelled to return home, but Dr. Smith has determined to continue the expedition. As the rainy season and unhealthy country are before him, and as such people as the Somali are easily dispirited by a first failure, it is hardly likely that Dr. Smith will reach Mount Wosho. He proposes to strike south for the Juba, and then westward across the Borana country to Basso Narok (Lake Rudolph). The expedition has already achieved some very interesting results, and if it succeed in its traverse of the Borana country, it will have amply atoned for its failure to reach its original goal of the Omo valley.

IN an address to the United States National Geographic Society, recently published in the *National Geographic Magazine*, Dr. C. Hart Merriam discusses the influence of temperature upon the geographical distribution of terrestrial animals and plants. It is well known that in the northern hemisphere animals and plants are distributed in circumpolar belts or zones, the boundaries of which follow lines of equal temperature; but difference of opinion prevails as to the period during which temperature exerts its restraining influence. Dr. Merriam opens new ground in the address to which we refer. Physiological botanists have long maintained that the various events in the life of plants, such as leafing, flowering, &c., take place when the plants have been exposed to definite quantities of heat, which are the sums total of the daily temperatures above a minimum (6° C.) assumed to be necessary for functional activity, and are termed the *physiological constants* of the particular stages. Dr. Merriam infers from this that there must also be a physiological constant for the species itself; and this *species constant* must be the total quantity of heat required by a given species to complete its cycle of development and reproduction. It follows that not only the mean temperature, but also the total quantity of heat in particular zones must be considered in estimating the influence of temperature upon the distribution of plants and animals. Dr. Merriam has constructed a pair of isothermal charts of the United States, of which one shows the distribution of the total quantity of heat during the season of growth and reproduction (*i.e.* the sum of daily mean temperatures above 6° C.), and the other the mean temperatures during the six hottest weeks of the year. By comparing these with a bio-geographical chart of the same region, Dr. Merriman concludes, from the striking coincidences which occur, that animals and plants are restricted in northward distribution by the total quantity of heat during the season of growth and reproduction, and in southward distribution by the mean temperature of a brief period during the hottest part of the year. The anomalous intermingling of boreal and austral types which occurs over an extensive area of the Pacific coast of the United States becomes explicable by the establishment of these principles, for here alone is a low summer temperature combined with a high sum-total of heat—the two conditions which permit extensive mixture in the same region of northern and southern types.

A CASE of dual brain action, presenting points of special interest, both in physiology and psychology, is described in *Brain* (Part lxix.) by Mr. L. C. Bruce. The patient who formed the subject of observation varied considerably in his mental condition, and the most obvious phenomena observed during these changes were that in one condition he spoke the English language, and in the other the Welsh language. When in the former state, he was the subject of chronic mania. He was right-handed, and exhibited a fair amount of intelligence. He remembered clearly things he had noticed in previous English periods, but his memory was a blank to any that occurred during the Welsh stages. He wrote by preference with his right hand, his letters were fairly legible, and he wrote from left to right. If asked to do so, he would write with the left hand, but then produced mirror writing, traversing the paper from right to left. When in the Welsh stage, however, he was left-handed and the subject of dementia. His speech was almost unintelligible, but what could be understood was in the Welsh language. In this stage he had no idea of English, and his mental and physical conditions altogether were the reverse of what they were in the English stage. From these observations, Mr. Bruce is led to believe that "the cerebral hemispheres are capable of individual mental action, and that the mentally active cerebrum has a preponderating influence over the control of the motor functions, the patient living two separate existences during the two stages through which he passes; the mental impressions received during each of these separate existences being recorded in one cerebral hemisphere only." If the cerebral hemispheres did not act independently, it is difficult to account for the patient's ignorance of events which happened to him in the Welsh stage when he passed into the English condition.

A NOTE on the electrostatic capacity of resistance coils wound in the ordinary way to avoid self-induction, is published in the *Comptes rendus* (February 11). The author (M. J. Cauro) has experimentally determined the electrostatic capacity of coils wound in several different ways, using for this purpose a Wheatstone's bridge arrangement with a commutator similar to that used by Ayrton and Perry in their secohmmeter. By comparing coils of practically the same shape and resistance the author finds that the errors due to capacity may, in the case of coils containing a large number of turns, be considerable when the ordinary double method of winding is adopted, but these errors are considerably reduced if the method of winding proposed by M. Chaperon is employed. The best results of all are obtained by winding the two wires in alternate layers, always starting from the same end of the bobbin, the wire being brought back parallel to the axis of the coil. For instance, with coils having a resistance of about 14,000 ohms and about 9500 turns, the three methods of winding give apparent self-induction (due to capacity) of −1·79, −0·27 and −0·16 respectively. In order to make sure that the values obtained were really due to capacity, the author placed bundles of fine iron wire inside the different coils. The results obtained in this case were the same as those obtained without any iron core. By altering the connection of the two wires in the coil wound in the ordinary manner, so that the current traversed the two circuits in the same direction, the self-induction was found to be 0·13. Thus by winding the wire-double, the error due to electrostatic capacity was about twelve times as great as the error to eliminate which this method of winding was adopted.

Two volumes recently added to the comprehensive Aide Mémoire series, published jointly by Gauthier-Villars and Masson, Paris, are:—"Appareils Accessoires des Chaudières a Vapeur," by MM. Dudebout and Croneau, and "Traité des Bicycles et Bicyclettes" by Dr. C. Bourlet.

THE names of the members of the electrical and kindred industries throughout the world are contained in "The Universal Electrical Directory," published by Messrs. H. Alabaster, Gatehouse, and Co. For simplicity and facility of reference the names are divided into four groups—namely, British, Continental, American, and Colonial, which are again subdivided into alphabetical and classified sections. There are nearly twenty-one thousand names in all, or two thousand five hundred more names than were given in the Directory for 1894.

AMONG the forthcoming books to be published by Messrs. J. and A. Churchill, the following are announced to appear at an early date:—"A Manual of Botany" based on that of the late Prof. Bentley, vol. i., "Morphology and Anatomy," enriched with a large number of new illustrations, by Prof. J. Reynolds Green; "Elements of Health, an Introduction to the Study of Hygiene," by Dr. Louis C. Parkes; and "Mental Physiology, especially in its relation to Mental Disorders," with illustrations, by Dr. T. B. Hyslop.

A VALUABLE work on the climatology of Africa, and on the distribution of disease in that continent, has just appeared. It is entitled "Tropical Diseases in Africa," by Dr. R. W. Felkin, and is published by Mr. W. F. Clay, Edinburgh. The volume is based upon a lecture delivered at the African Ethnological Congress held at Chicago in 1893, and contains, as an appendix, a paper, read before the Budapest Congress last September, on a new method for graphically illustrating the geographical distribution of disease. The book forms an important addition to the literature upon tropical disease in Africa.

MEN of science are indebted to the beneficent provisions of the Smithsonian Institution for the generous distribution of scientific literature. A publication of special value to chemists is the "Bibliography of Aceto Acetic Ester and its Derivatives," by Mr. Paul H. Seymour, which, acting upon the recommendation of the American Association's Committee on Indexing Chemical Literature, the Institution has lately issued. The bibliography is arranged in chronological order from 1840, with author and subject indices appended. The outlines of memoirs are given, in order to show the scope of the originals. Mr. Seymour deserves the gratitude of chemists for this time-saving bibliography, upon which he has evidently bestowed much care.

ANOTHER paper prepared for the Committee on Indexing Chemical Literature, is "An Index to the Literature of Didymium," by Dr. A. C. Langmuir, just distributed as No. 972 of the Smithsonian Miscellaneous Collections. The index contains references to all the papers published on didymium, from the discovery of the element in 1842 to the year 1893. It furnishes a striking illustration of the wonderful results accomplished by the use of the spectroscope in modern chemistry. In addition to didymium, the following elements have now been indexed: Columbium, iridium, manganese, titanium, uranium, vanadium.

WE note the publication of the *Bulletin Météorologique* of the Imperial Observatory of Constantinople, for the year 1894. Although telegraphic observations have been published in the Paris weather report, we believe that very few regular observations from Constantinople have been received in this country for some twenty years. The bulletin contains some means derived from twenty-seven years' observations, which show that the maximum shade temperature was 99°·5, in 1888, and the minimum, 17°·2, in 1869. The average yearly rainfall is 23·3 inches, and the average frequency, eighty-six days. Snow falls on about fifteen days, and fog occurs, on an average, on fifty-nine days. An appendix contains a list of the earthquakes in the Ottoman empire during the year 1894.

A SKETCH of the attainments and life-work of Dr. T. B. Rake, who died at Trinidad last August, is given in the *Journal* of the Trinidad Field-Naturalists Club for December 1894. Dr. Rake was the superintendent of the Leper Asylum at Trinidad, and presided over the Leprosy Commission. The reports issued during his eight years' administration of the Asylum are of the highest value, for he was well acquainted with bacteriological methods of research, and he put on record numerous observations referring to the leprosy bacillus. He was not, however, only a high authority on leprosy, but an enthusiastic and keen observer of nature. At the time of his death he was the President of the Trinidad Field-Naturalists Club, the members of which will remember him for many years to come. An excellently reproduced portrait of Dr. Rake forms the frontispiece of the *Journal* containing the very appreciative obituary notice.

A MONUMENT to the humanitarian spirit of the members of the Mulhouse Association pour prevenir les Accidents des

Fabriques is afforded by a ponderous volume, the second edition of which has been received from the Association. The volume is entitled "Collection of Appliances and Apparatus for the Prevention of Accidents in Factories." It is illustrated by thirty-seven finely-drawn plates, and the text is printed in French, German, and English. The London agents are Messrs. Dulau and Co. What strikingly indicates the high motives which actuate the Association is that the volume is published at the price it cost to reproduce. The one object of publication is to spread the knowledge, and encourage the adoption, of the numerous appliances devised for the prevention of accidents from machinery. The factory inspector and manager, the mechanical engineer, and all others who are concerned in the construction and use of machinery, should see this very useful volume.

We have received the first two numbers (1892–1893) of the yearly *Bulletin of the Geological Institution of the University of Upsala*. This is a publication that should be of great interest to all British geologists whose work lies among the Lower Palæozoic rocks, since on those strata Swedish researches have thrown so much light. Among the contents are two papers by C. Wiman, on the structure of Graptolites; stratigraphical papers, by the same author, and J. G. Andersson; petrographical and mineralogical papers, by Prof. Nordenskiold and H. Sjögren; and others. Nine plates in all, illustrate the numbers. The papers are all in either English or German (French is the only other language permitted); this will be satisfactory to those British geologists who have found the Swedish language a serious barrier to the study of important geological papers in the past. We may add that the *Bulletin* will be sent, not only to all geological institutions, but also to all private workers who send their publications regularly in exchange.

Among the new editions received during the past week, is the second edition of the "Introduction to Physiological Psychology" (Swan Sonnenschein and Co.), translated from the revised and enlarged second German edition of Dr. Trichen's work, reviewed in these columns four years ago (vol. xliv. p. 145). The chief addition is a chapter upon the emotional tone of the ideas. Another new edition (the fourth), just received, is "A Treatise on Elementary Trigonometry" (Longmans, Green, and Co.), by Dr. John Casey, F.R.S., edited by Prof. P. A. E. Dowling. This little work has found favour among many teachers and students, and the new issue should be even more popular. Dr. W. H. Besant's "Conic Sections" (George Bell and Sons) has reached a ninth edition. The articles on reciprocal polars have been expanded into a separate chapter, and a chapter on conical projections has been inserted. Two other books, which may be included among new issues, belong to the handy series of Economic Classics published by Messrs. Macmillan and Co. One consists of select chapters and passages from Adam Smith's "Wealth of Nations"; the other contains the first six chapters of Ricardo's "Principles of Political Economy and Taxation."

Messrs. Swan Sonnenschein and Co. have in the press an important work on the Indian Calendar, written by Mr. Robert Sewell, in collaboration with Mr. Sankara Bâlkrishna Dikshit. The work contains complete tables for the verification of Hindu and Muhammadan dates for a period of 1600 years (A.D. 300 to 1900), and forms an attempt to carry out in practical form the exact fixation of the astronomical phenomena on which the Hindu Calendar depends, and without which no conversion of dates into European reckoning can be safely relied upon. It embraces the whole of India. The calculations have been based on the general tables published by Prof. Jacobi, of Bonn, checked and enlarged by Mr. S. Bâlkrishna Dikshit. The precise position of sun and moon at sunrise on the meridian of Ujjain on the first day of each year of the Luni-solar Calendar during the period referred to is given, and for the Solar Calendar the moment of the sun's passing the first point of Aries in each year is entered in time reckoning. Full details for the addition and suppression of months in the intercalary Luni-solar years are provided; and where necessary the calculations have been made for true as well as mean intercalations. The solar phenomena have, moreover, been computed by both the Ârya and Surya Siddhântas. It is hoped that the volume will form a standard work of reference for chronologists, as well as for all courts and offices in India.

The additions to the Zoological Society's Gardens during the past week include a Giraffe (*Giraffa camelopardalis*, ♀) two Sable Antelopes (*Hippotragus niger*, ♂ ♀) two Brindled Gnus (*Connochætes taurina*, ♂ ♀), a Levaillant's Cynictis (*Cynictis penicillata*) from South Africa, two great Eagle Owls (*Bubo maximus*), European, purchased; two Rock-hopper Penguins (*Eudyptes chrysocome*) from New Zealand, four Black Francolins (*Francolinus vulgaris*) from India, a Robben Island Snake (*Coronella phocarum*) from South Africa, deposited; a Black-headed Gull (*Larus ridibundus*), British, presented by Mrs. Rees Davis; a —— Buzzard (*Buteo*, sp. inc.) from South Africa, presented by Mr. J. E. Matcham; a Robben Island Snake (*Coronella phocarum*) from South Africa, presented by Dr. Arthur D. Bensusan.

## *OUR ASTRONOMICAL COLUMN.*

Spectroscopic Measures of Planetary Velocities.—A new feature in the application of the Doppler-Fizeau principle has been recently brought forward by M. Deslandres (*Comptes rendus*, Feb. 25). It is to the effect that when we observe the spectrum of a body shining by reflected light the displacement of the lines due to movements in the line of sight depends upon the movement of the body with respect to the original source of light, as well as on its movement with regard to the observer.

The truth of this principle is demonstrated by an investigation of the rotation of Jupiter which M. Deslandres has carried out with his usual skill. The equatorial linear velocity of the planet is 12·4 kilometres, and the difference of the velocities of the two extreme edges 24·8 kilometres; actual measurements of the spectrum photographs taken near opposition, however, show a relative movement of twice this amount. The best results appear to have been obtained by allowing the equator of the planet to lie along the slit of the spectroscope, in which case the effect of the displacements at different distances from the centre is obviously to produce an inclination of the lines of the planet spectrum to the lines of the comparison spectrum, and this inclination affords the means of determining the velocities. This method has the advantage that the effects of small movements of the image on the slit during the long exposure necessary with the great dispersion employed are of little consequence; movements in declination will have no effect on the inclination of the lines, and movements in right ascension will only tend to make them somewhat more diffuse.

M. Deslandres points out that the new principle may possibly have many important applications in connection with planetary velocities, among which he specially mentions the determination of the rotation period of Venus, and even possibly of the solar parallax, the latter being derived from the radial velocity of Venus. M. Poincaré shows that M. Deslandres' results are quite in accordance with theoretical considerations.

The Satellites of Mars.—Prof. Campbell, of the Lick Observatory, took advantage of the recent opposition of Mars to secure a long series of micrometric measurements of the satellites with the 3-foot telescope (*Astr. Journal*, No. 337). The reduction of the observations of Phobos shows that the eastern elongation distance was nearly a second greater than the western, whereas Hall's observations in 1877 showed that the distance at western elongation was then about 2″·2 greater